

Winchester
Laufwerk

10 MB

TANDON OEM OPERATING AND SERVICE MANUAL
MODEL NUMBERS TM602S, TM603S, AND TM603SE
5.25" RIGID DISK DRIVES

SEPTEMBER 20, 1982

PRELIMINARY

TANDON CORPORATION
20320 PRAIRIE STREET
CHATSWORTH, CA 91311

TEL. NO.: (213) 993-6644
TWX NO.: 910-494-1721
TELEX NO.: 194794

TANDON INTERNATIONAL GMBH
AM SUEDPARK 7A
D-6092 KELSTERBACH, WEST GERMANY

TEL. NO.: 06 11/49 6107 2091
TELEX NO.: 411547
P/N 187275-004 Rev. C

CONTENTS

Page Number

SECTION I--GENERAL INFORMATION

1.1	Scope	1-1
1.2	Introduction	1-1
1.3	Disk Drive Performance Characteristics .	1-1
1.4	Disk Drive Model Specifications	1-1
1.5	Physical Dimensions	1-4

SECTION II--INSPECTION, INSTALLATION, AND INTERFACES

2.1	Introduction	2-1
2.2	Unpacking and Inspection	2-1
2.3	Mounting Characteristics	2-3
2.4	Power Cabling	2-3
2.5	Standard Interface	2-3

SECTION III--THEORY OF OPERATION

3.1	Introduction	3-1
3.2	Input Control Lines	3-2
3.2.1	Reduced Write Current	3-2
3.2.2	Write Gate	3-2
3.2.3	Head Select	3-3
3.2.4	Step Interface	3-3
3.2.5	Direction In	3-4
3.2.6	Drive Select	3-4
3.3	Output Control Lines	3-5
3.3.1	Drive Selected	3-5
3.3.2	Seek Complete	3-5
3.3.3	Track 000	3-5
3.3.4	Fault	3-6
3.3.5	Line Ready	3-6
3.3.6	Index	3-6
3.4	Data Transfer Lines	3-6
3.4.1	MFM Write Data	3-6
3.4.2	MFM Read Data	3-7

ST. LOUIS, MO.,

TO THE HONORABLE SENATE OF THE UNITED STATES

IN SENATE,

REPORT

OF THE

COMMISSIONERS OF THE GENERAL LAND OFFICE

LIST OF ILLUSTRATIONS

FIGURES

<u>Figure Number</u>	<u>Title</u>	<u>Page Number</u>
1	Typical Starting Current at Nominal Voltage	1-3
2	Disk Drive Physical Dimensions	1-5
3	Locations of Interface Connectors	2-2
4	J3 Connector	2-3
5	J1 Connector Dimensions	2-4
6	J2 Connector Dimensions	2-4
7	Control Signal Driver/Receiver Circuit Combination	3-1
8	Step Mode Timing Diagram	3-4
9	Data Line Driver/Receiver Circuit	3-7

TABLES

<u>Table Number</u>	<u>Title</u>	<u>Page Number</u>
1	Disk Drive Performance Characteristics ..	1-2
2	Disk Drive Model Specifications	1-4
3	Standard Interface	2-7
4	Head Select	3-3

APPENDIX

<u>Appendix Number</u>	<u>Title</u>	<u>Page Number</u>
A	Customer Information Bulletins	A-1
B	Schematics	B-1

SECTION I--GENERAL INFORMATION

1.1 SCOPE

This manual contains information useful in the installation and operation of Tandon Corporation's TM600 family of 5.25" rigid disk drives. This manual also contains interface requirements and descriptions of signals. TM600 refers to Model Numbers TM602S, TM603S, and TM603SE, as appropriate.

1.2 INTRODUCTION

The TM600 family of 5.25" rigid disk drives are low-cost, random access memories that use moving head, noncontact recording techniques. There are both two- and three-platter models, which use standard Winchester technology and 130 millimeter rigid media.

This drive consists of storage media that is contained within the drive in a fixed (nonoperator removable) configuration, read/write and control electronics, the drive mechanism, a read/write head, a precision split band positioning device, and an air filtration system.

Interface flexibility is provided by using an industry standard interface on the drive. The "S" version is compatible with larger capacity disk drives. Compatible is defined as using the same pin assignment where the signal and the function are common.

1.3 DISK DRIVE PERFORMANCE CHARACTERISTICS

The information contained in Table 1 pertains to all models of the Tandon TM600 family of disk drives.

1.4 DISK DRIVE MODEL SPECIFICATIONS

Table 2 contains a list of the drive models available and the number of platters each one has.

Table 1

Disk Drive Performance Characteristics

Model	TM602S	TM603S	TM603SE
Disks/Platters	2	3	3
Heads/Recording Surfaces	4	6	6
TPI.....	254	254	254
Cylinders	153	153	230
RPM.....	3600 RPM \pm 1 percent.....		
Recording Capacity,			
Unformatted:			
Per Drive	6.38 MBytes	9.57 MBytes	14.35 MBytes
Per Surface	1.59 MBytes	1.59 MBytes	2.39 MBytes
Per Track.....	10.40 KBytes.....		
Transfer Rate.....	5 Mbits per second.....		
Recording Density (BPI)	7690	7690	9625
Tracks	612	918	1380
Access Time			
Track-to-Track	3 milliseconds.....		
Average	153 ms, 99 ms	153 ms, 99 ms	210 ms, 137 ms
	ramped seek	ramped seek	ramped seek
Head Settling Time.....	15 milliseconds.....		
Average Latency.....	8.34 milliseconds.....		
Mechanical Dimensions			
Height.....	3.25 inch.....		
Width.....	5.75 inch.....		
Length.....	8.00 inch.....		
Error Rates			
Soft Read.....	1×10^{10} bits.....		
Hard Read.....	1×10^{12} bits.....		
Seek Errors.....	1×10^6 seeks.....		
Power			
+12V D. C. +/-	10% 1.5 amps typical, 5 amps maximum for 10 seconds with no more than 5 millivolts PARD* (see Figure 1).		
+5V D. C. +/-	5% .8 amps typical with no more than 50 millivolts PARD*		
Environmental			
Ambient Temperature:	Operating:	16°C to 46°C (50°F to 115°F)	
	Nonoperating:	-35.4°C to 60°C (-40°F to 140°F)	
Relative Humidity:	8% to 80%		
Maximum Wet Bulb Temperature:	26°C without condensation		

*Periodic and Random Deviation.

Specifications Subject To Change Without Notice.

100

1975-1976, 1976-1977, 1977-1978, 1978-1979, 1979-1980, 1980-1981, 1981-1982, 1982-1983, 1983-1984, 1984-1985, 1985-1986, 1986-1987, 1987-1988, 1988-1989, 1989-1990, 1990-1991, 1991-1992, 1992-1993, 1993-1994, 1994-1995, 1995-1996, 1996-1997, 1997-1998, 1998-1999, 1999-2000, 2000-2001, 2001-2002, 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016, 2016-2017, 2017-2018, 2018-2019, 2019-2020, 2020-2021, 2021-2022, 2022-2023, 2023-2024, 2024-2025, 2025-2026, 2026-2027, 2027-2028, 2028-2029, 2029-2030, 2030-2031, 2031-2032, 2032-2033, 2033-2034, 2034-2035, 2035-2036, 2036-2037, 2037-2038, 2038-2039, 2039-2040, 2040-2041, 2041-2042, 2042-2043, 2043-2044, 2044-2045, 2045-2046, 2046-2047, 2047-2048, 2048-2049, 2049-2050, 2050-2051, 2051-2052, 2052-2053, 2053-2054, 2054-2055, 2055-2056, 2056-2057, 2057-2058, 2058-2059, 2059-2060, 2060-2061, 2061-2062, 2062-2063, 2063-2064, 2064-2065, 2065-2066, 2066-2067, 2067-2068, 2068-2069, 2069-2070, 2070-2071, 2071-2072, 2072-2073, 2073-2074, 2074-2075, 2075-2076, 2076-2077, 2077-2078, 2078-2079, 2079-2080, 2080-2081, 2081-2082, 2082-2083, 2083-2084, 2084-2085, 2085-2086, 2086-2087, 2087-2088, 2088-2089, 2089-2090, 2090-2091, 2091-2092, 2092-2093, 2093-2094, 2094-2095, 2095-2096, 2096-2097, 2097-2098, 2098-2099, 2099-2100, 2100-2101, 2101-2102, 2102-2103, 2103-2104, 2104-2105, 2105-2106, 2106-2107, 2107-2108, 2108-2109, 2109-2110, 2110-2111, 2111-2112, 2112-2113, 2113-2114, 2114-2115, 2115-2116, 2116-2117, 2117-2118, 2118-2119, 2119-2120, 2120-2121, 2121-2122, 2122-2123, 2123-2124, 2124-2125, 2125-2126, 2126-2127, 2127-2128, 2128-2129, 2129-2130, 2130-2131, 2131-2132, 2132-2133, 2133-2134, 2134-2135, 2135-2136, 2136-2137, 2137-2138, 2138-2139, 2139-2140, 2140-2141, 2141-2142, 2142-2143, 2143-2144, 2144-2145, 2145-2146, 2146-2147, 2147-2148, 2148-2149, 2149-2150, 2150-2151, 2151-2152, 2152-2153, 2153-2154, 2154-2155, 2155-2156, 2156-2157, 2157-2158, 2158-2159, 2159-2160, 2160-2161, 2161-2162, 2162-2163, 2163-2164, 2164-2165, 2165-2166, 2166-2167, 2167-2168, 2168-2169, 2169-2170, 2170-2171, 2171-2172, 2172-2173, 2173-2174, 2174-2175, 2175-2176, 2176-2177, 2177-2178, 2178-2179, 2179-2180, 2180-2181, 2181-2182, 2182-2183, 2183-2184, 2184-2185, 2185-2186, 2186-2187, 2187-2188, 2188-2189, 2189-2190, 2190-2191, 2191-2192, 2192-2193, 2193-2194, 2194-2195, 2195-2196, 2196-2197, 2197-2198, 2198-2199, 2199-2200, 2200-2201, 2201-2202, 2202-2203, 2203-2204, 2204-2205, 2205-2206, 2206-2207, 2207-2208, 2208-2209, 2209-2210, 2210-2211, 2211-2212, 2212-2213, 2213-2214, 2214-2215, 2215-2216, 2216-2217, 2217-2218, 2218-2219, 2219-2220, 2220-2221, 2221-2222, 2222-2223, 2223-2224, 2224-2225, 2225-2226, 2226-2227, 2227-2228, 2228-2229, 2229-2230, 2230-2231, 2231-2232, 2232-2233, 2233-2234, 2234-2235, 2235-2236, 2236-2237, 2237-2238, 2238-2239, 2239-2240, 2240-2241, 2241-2242, 2242-2243, 2243-2244, 2244-2245, 2245-2246, 2246-2247, 2247-2248, 2248-2249, 2249-2250, 2250-2251, 2251-2252, 2252-2253, 2253-2254, 2254-2255, 2255-2256, 2256-2257, 2257-2258, 2258-2259, 2259-2260, 2260-2261, 2261-2262, 2262-2263, 2263-2264, 2264-2265, 2265-2266, 2266-2267, 2267-2268, 2268-2269, 2269-2270, 2270-2271, 2271-2272, 2272-2273, 2273-2274, 2274-2275, 2275-2276, 2276-2277, 2277-2278, 2278-2279, 2279-2280, 2280-2281, 2281-2282, 2282-2283, 2283-2284, 2284-2285, 2285-2286, 2286-2287, 2287-2288, 2288-2289, 2289-2290, 2290-2291, 2291-2292, 2292-2293, 2293-2294, 2294-2295, 2295-2296, 2296-2297, 2297-2298, 2298-2299, 2299-2300, 2300-2301, 2301-2302, 2302-2303, 2303-2304, 2304-2305, 2305-2306, 2306-2307, 2307-2308, 2308-2309, 2309-2310, 2310-2311, 2311-2312, 2312-2313, 2313-2314, 2314-2315, 2315-2316, 2316-2317, 2317-2318, 2318-2319, 2319-2320, 2320-2321, 2321-2322, 2322-2323, 2323-2324, 2324-2325, 2325-2326, 2326-2327, 2327-2328, 2328-2329, 2329-2330, 2330-2331, 2331-2332, 2332-2333, 2333-2334, 2334-2335, 2335-2336, 2336-2337, 2337-2338, 2338-2339, 2339-2340, 2340-2341, 2341-2342, 2342-2343, 2343-2344, 2344-2345, 2345-2346, 2346-2347, 23

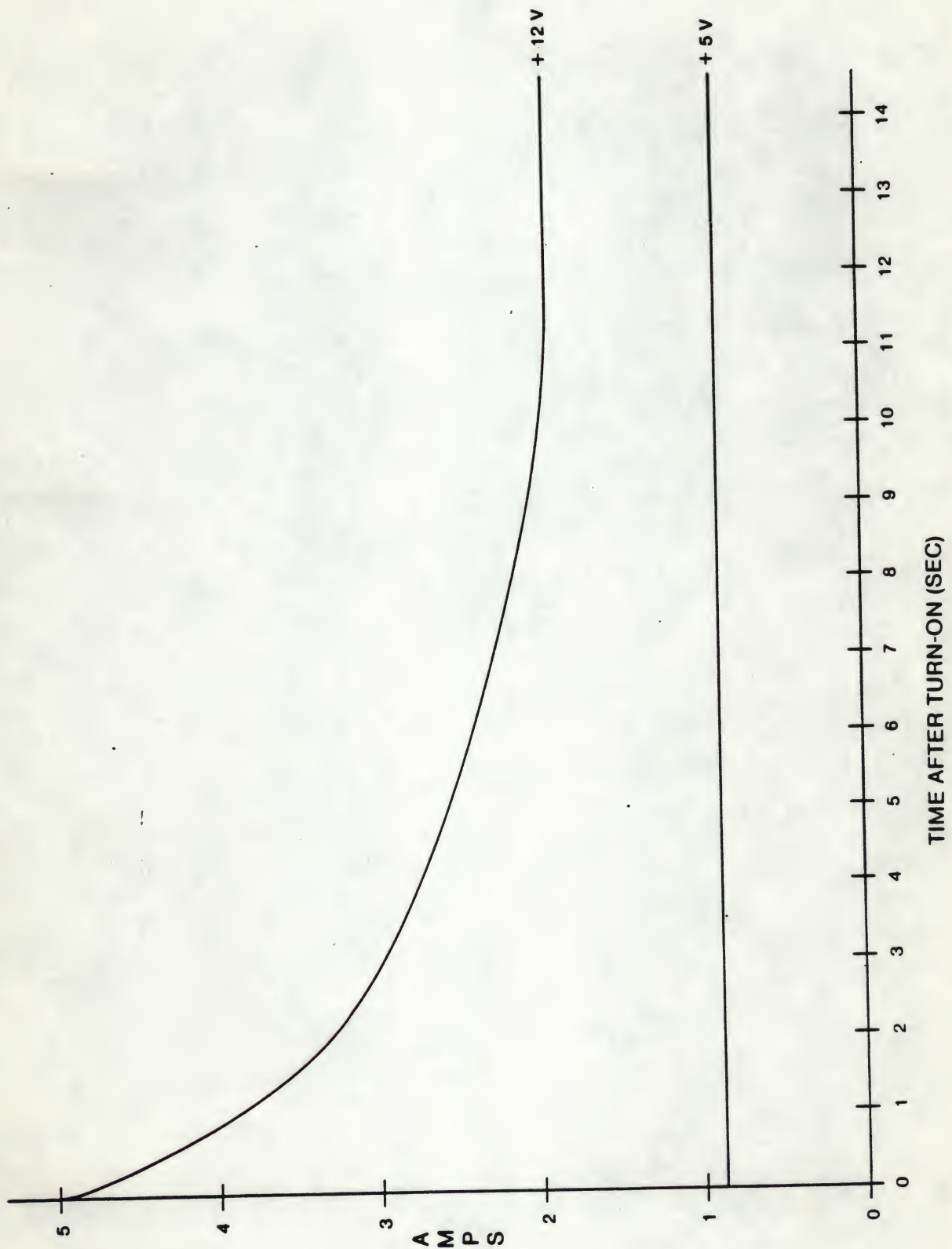


Figure 1
Typical Starting Currents At Nominal Voltage

Table 2
Disk Drive Model Specifications

<u>Model Number</u>	<u>Number of Platters</u>	<u>Kind of Interface</u>
TM602-S	2	Standard
TM603-SE	3	Standard/Extended Version
TM603-S	3	Standard

1.5 PHYSICAL DIMENSIONS

The major physical dimensions of the TM600 family of drives are contained in Figure 2. These dimensions are given in English and in metric units.

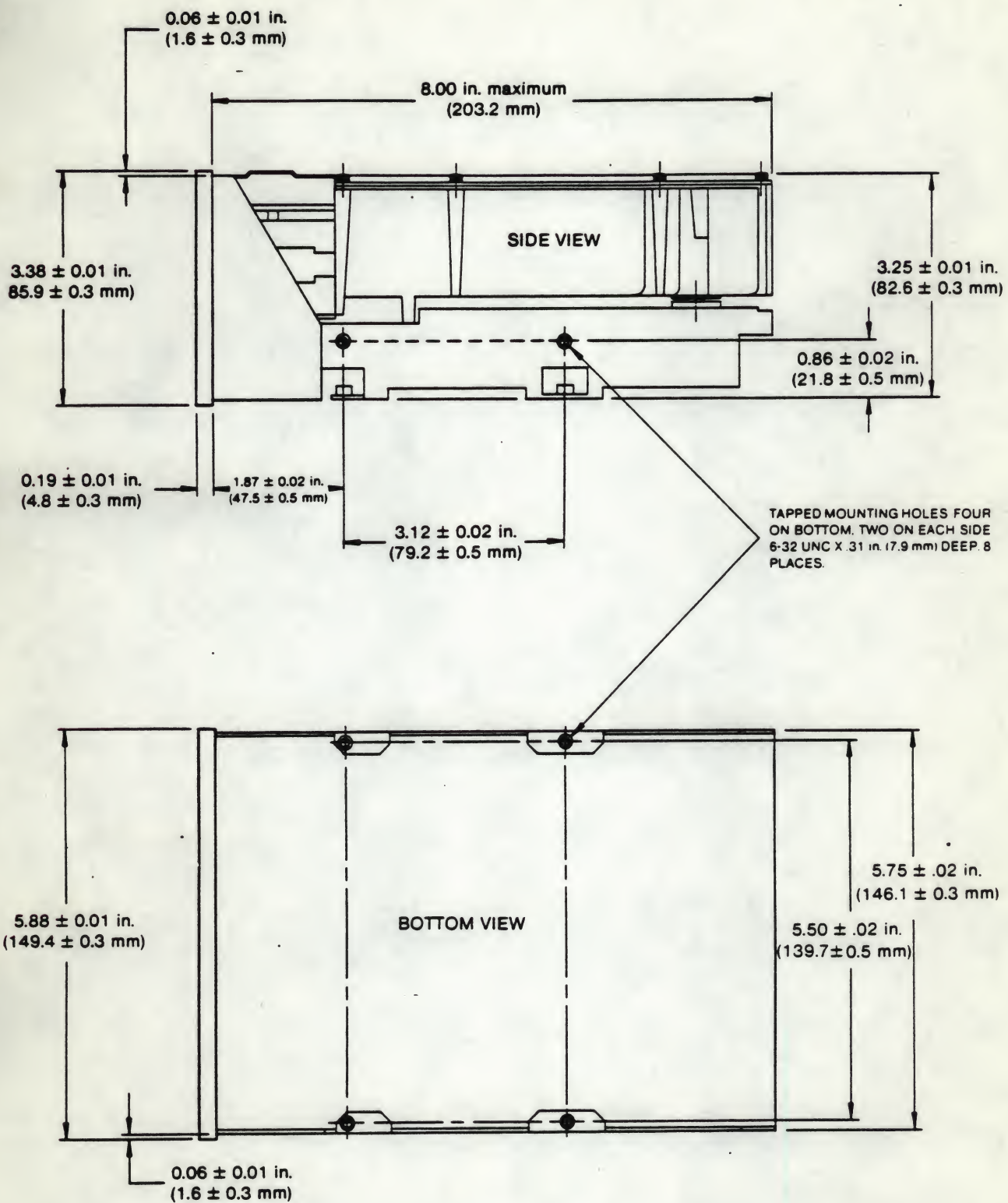


Figure 2
Disk Drive Physical Dimensions

SECTION II--INSPECTION, INSTALLATION, AND INTERFACES

2.1 INTRODUCTION

This section contains information pertinent to the inspection, installation, and interfaces of the Tandon TM600 family of rigid disk drives.

The electrical interface between the drive and the host system is via four connectors. J1 provides control signals for the drive. J2 provides for the radial connection of read/write data signals. J3 provides for D. C. power. J4 provides for frame ground. Figure 3 contains the locations of the interface connectors.

2.2 UNPACKING AND INSPECTION

The drive is shipped in a protective container which, when bulk packaged, minimizes the possibility of damage during shipment. The following procedure is the recommended method of uncrating the drive.

1. Place the shipping container on a flat work surface.
2. Remove the upper half of the inner container.
3. Remove the drive from the lower half of the inner container.
4. Check the model number and top assembly description against the packing slip.
5. Visually examine the contents of the shipping container for possible damage.
6. Notify the carrier immediately if any damage is found.
7. The inside chamber of the drive is a sealed compartment that must not be opened.

NOTE

REMOVAL OF THE COVER OF THE DRIVE
INVALIDATES THE WARRANTY.

January 10, 1900

Dear Mr. [Name]

I have received your letter of the 8th inst.

and am glad to hear that you are interested in the [Project]

I have been thinking of you very much lately and

am sure that you will find the [Project] very

interesting and profitable.

I am sure that you will find the [Project]

very interesting and profitable.

I am sure that you will find the [Project]

very interesting and profitable.

I am sure that you will find the [Project]

very interesting and profitable.

I am sure that you will find the [Project]

very interesting and profitable.

I am sure that you will find the [Project]

very interesting and profitable.

I am sure that you will find the [Project]

very interesting and profitable.

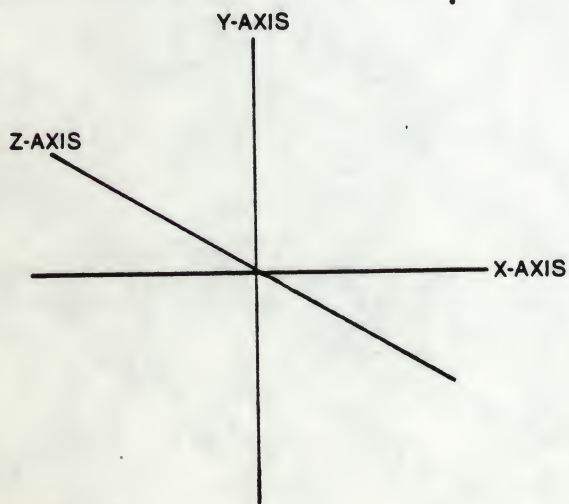
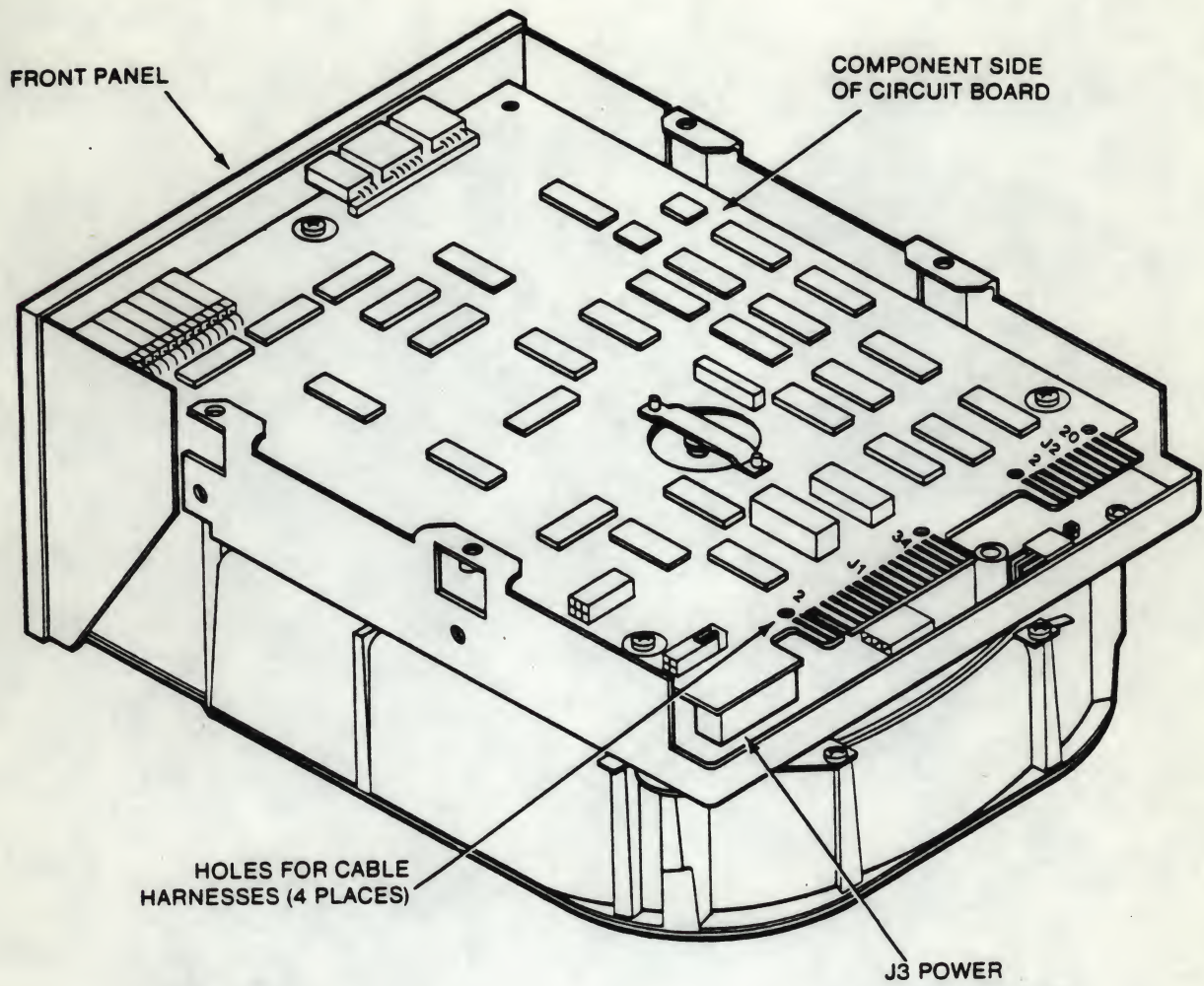
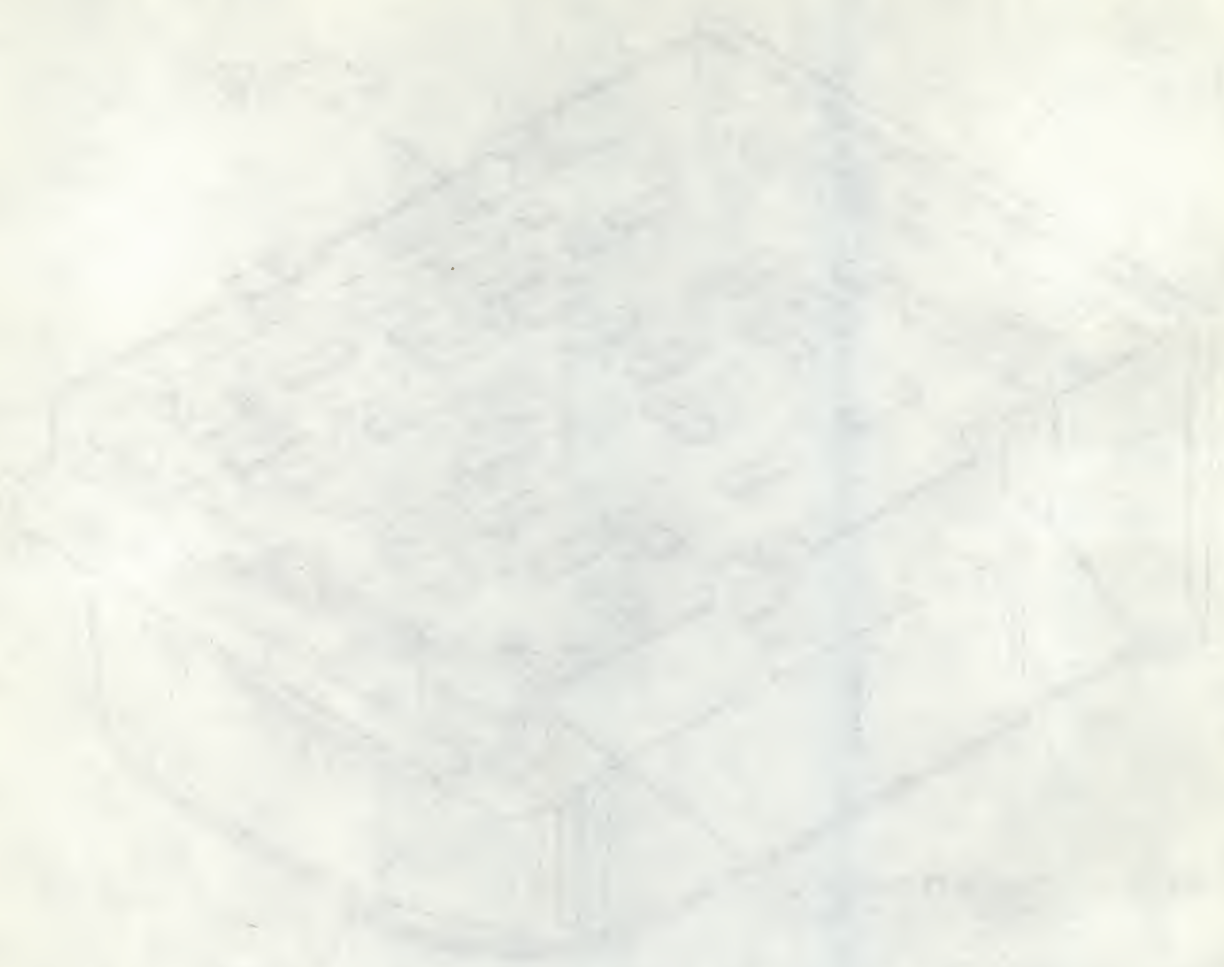


Figure 3
Locations of Interface Connectors



Architectural Drawing

Before applying power to the disk drive, the following inspection procedure should be performed:

1. Check to ensure that the circuit boards are secure.
2. Check to ensure that the connectors are firmly seated.
3. Notify the carrier immediately if you find any damage.

2.3 MOUNTING CHARACTERISTICS

The mounting characteristics of the TM600 family of disk drives are contained in Figure 2. There are four 6-32, tapped mounting holes on the bottom of the disk drive, and two on each side of it.

2.4 POWER CABLING

The D.C. power connector, J3, is a four-pin AMP Mate-N-Lok device, P/N 350211-1, which is mounted on the solder side of the circuit board. The recommended mating connector, P3, is AMP P/N 1-480424-0, using AMP pins P/N 60617-4. J3 pins are labeled on the J3 connector. Figure 4 contains an illustration of the J3 connector.

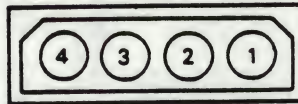


Figure 4

J3 Connector

The frame ground connector, J4 is the Faston AMP P/N 61761-2. The recommended mating connector is AMP P/N 62187-1.

2.5 STANDARD INTERFACE

The standard or "S" model interface is contained in Table 2-1. Connection to J1 is via a 34-pin circuit board edge connector. The dimensions of the J1 connector are found in Figure 5. The pins are numbered 1 through 34. The even numbered pins are located on the component side of the circuit board. Pin 2 located on the end of the circuit board connector closest to the D. C. power connector J3/P3, and it is labeled. A key slot is located between Pins 4 and 6.

1. The first part of the report deals with the general situation of the country and the progress of the work during the year. It is divided into two main sections: the first section deals with the general situation of the country and the progress of the work during the year. The second section deals with the specific results of the work.

2. The second part of the report deals with the specific results of the work. It is divided into three main sections: the first section deals with the results of the work in the field of agriculture, the second section deals with the results of the work in the field of industry, and the third section deals with the results of the work in the field of commerce.

3. The third part of the report deals with the conclusions of the work and the recommendations for the future.

4. The fourth part of the report deals with the financial statement of the work. It is divided into two main sections: the first section deals with the income of the work and the second section deals with the expenditure of the work.

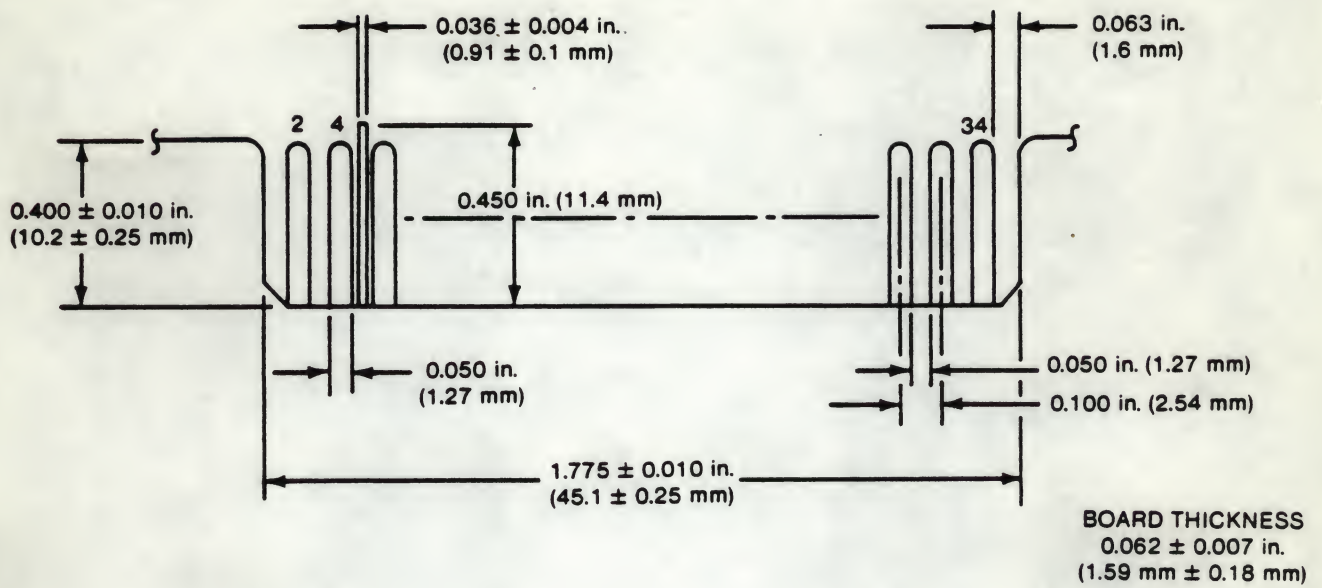


Figure 5
J1 Connector Dimensions

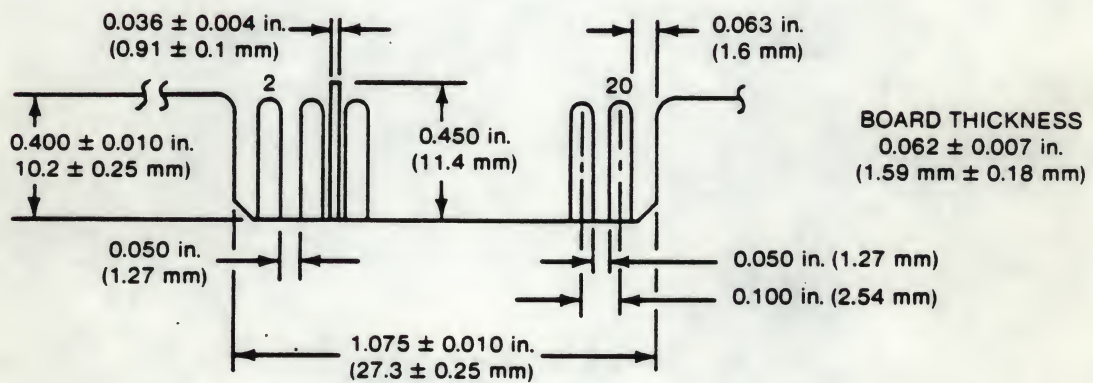


Figure 6
J2 Connector Dimensions



The recommended mating connector for P1 is a 3M ribbon connector, P/N 3463-0001, without ears.

Connection to J2 is via a 20-pin circuit board edge connector. The dimensions of the J2 connector are found in Figure 6. The pins are numbered 1 through 20. The even numbered pins are located on the component side of the circuit board. The recommended mating connector for P2 is a 3M ribbon connector, P/N 3461-0001, without ears. A key slot is located between Pins 4 and 6.

THE UNIVERSITY OF CHICAGO
DIVISION OF THE PHYSICAL SCIENCES
DEPARTMENT OF CHEMISTRY
530 SOUTH EAST ASIAN AVENUE
CHICAGO, ILLINOIS 60607
TEL. 373-5500
FAX 373-5501
WWW.CHEM.UCHICAGO.EDU

Table 3
Standard Interface

Connector	Interface		Signal		Signal Name
	Pin Number	Signal (Gnd)	Type	I/O	
P1 ↑ 34-Pin Ribbon Daisy Chain ↓ P1	2	(1)	S	I	Reduce Write I
	4	(3)	S	-	Head Select 2 ²
	6	(5)	S	I	Write Gate
	8	(7)	S	O	Seek Complete
	10	(9)	S	O	Track 000
	12	(11)	S	O	Fault
	14	(13)	S	I	Head Select 2 ⁰
	16	(15)	-	-	Reserved (To J2-7)
	18	(17)	S	I	Head Select 2 ¹
	20	(19)	S	O	Index
	22	(21)	S	O	Ready
	24	(23)	S	I	Step
	26	(25)	S	I	Drive Select 0
	28	(27)	S	I	Drive Select 1
	30	(29)	S	I	Drive Select 2
	32	(31)	S	I	Drive Select 3
	34	(33)	S	I	Direction In
P2 ↑ 20-Pin Ribbon Daisy Chain or Radial ↓ P2	1	(2)	S	O	Drive Selected
	3	(4)	S	-	Reserved (+5 V)
	5	(6)	S	I	Reset
	7	(8)	-	-	Reserved (To J1-16)
	9	(10)	-	-	Spare
	11	(12)	-	-	Ground
	13		D	I	+ Write Data
	14		D	I	- Write Data
	15	(16)	-	-	Ground
	17		D	O	+ Read Data
P3 ↑ 4-Pin Power Radial ↓ P3	18		D	O	- Read Data
	19	(20)	-	-	Ground
P3 ↑ 4-Pin Power Radial ↓ P3	1			-	+12 V D. C. In
	2			-	12 V Return
	3			-	5 V Return
	4			-	+5 V D. C. In

Notes:

- | | |
|---------------------|---------------------|
| 1. S - Single ended | 3. I - Drive input |
| 2. D - Differential | 4. 0 - Drive output |

SECTION III--THEORY OF OPERATION

3.1 INTRODUCTION

There are three kinds of interface signals:

1. Input Control Lines
2. Output Control Lines
3. Data Transfer Lines

Signals on the Input Control lines are standard TTL levels. They have the following electrical specifications:

True: 0.0 volt D. C. to 0.4 volt D. C. @ $I = 40$ mA maximum

False: 2.5 volt D. C. to 5.25 volt D. C. @ $I = 0$ mA open

See Figure 7 for the recommended circuit.

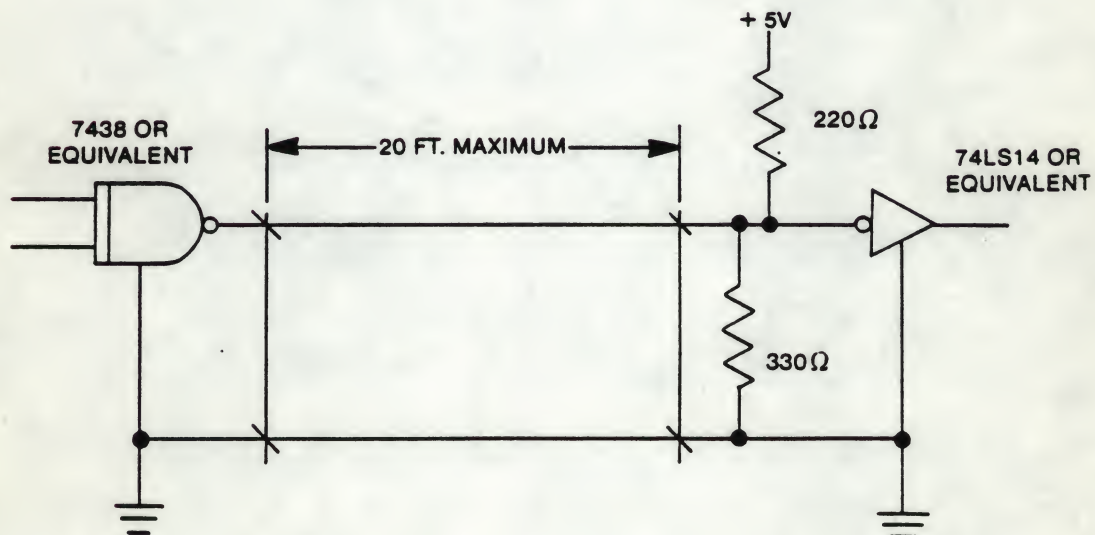


Figure 7

Control Signal Driver/Receiver Circuit Combination

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

10/10/10

3.2 INPUT CONTROL LINES

There are two kinds of Input Control lines, those that are multiplexed in a multiple drive system and those that do the multiplexing.

The Input Control lines that are multiplexed include:

1. Reduced Write Current
2. Write Gate
3. Head Select
4. Step Interface
5. Direction In

The Input Control lines that do the multiplexing are:

1. Drive Select 0
2. Drive Select 1
3. Drive Select 2
4. Drive Select 3

3.2.1 Reduced Write Current

When this Input Control line is activated low (true) in conjunction with the write gate, a lower value of write current is selected for writing on the disk. When the signal is set high (false), the higher value write current is selected. When writing on Tracks 0 through 127, it is recommended that this line be set false. For Tracks 128 and greater, the Reduced Write Current line should be set true.

A 220/230 ohm resistor pack allows the line to be terminated.

3.2.2 Write Gate

The Write Gate signal enables data to be written on the disk when it is activated or when the logical zero (true) level is reached. The ready line must be valid before write gate is activated. If a disk drive fault occurs, further writing on the disk is prohibited. In addition, the Seek Complete line should go true before you begin to write any information on the disk.

The inactive or logical high (false) level on the Write Gate line enables the step pulses to step the head arm actuator.

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY

RECEIVED

APR 10 1964

1964

CHICAGO

ILLINOIS

U.S.A.

FROM

TO

BY

DATE

TIME

PLACE

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY
5408 S. UNIVERSITY AVE.
CHICAGO, ILL. 60637
U.S.A.

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY
5408 S. UNIVERSITY AVE.
CHICAGO, ILL. 60637
U.S.A.

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY
5408 S. UNIVERSITY AVE.
CHICAGO, ILL. 60637
U.S.A.

3.2.3 Head Select

There are three Head Select lines. They are used to select each read/write head--0, 1, or 2--in a binary coded sequence.

Head Select signals are logic low (true) levels. They must be activated in conjunction with the Drive Select lines. The heads are numbered 0 through 5. Head Select 0 is the least significant line. Table 3-1 contains information about the Head Select line sequence, disk drive model number, and numbers that may be selected.

Table 3-1

Head Select

Head Select Line Sequence			Model Number	
2 ²	2 ¹	2 ⁰	TM602	TM603
			Head Number	Selected
1	1	1	0	0
1	1	0	1	1
1	0	1	2	2
1	0	0	3	3
0	1	1		4
0	1	0		5

Legend: 1 = Logical High (False)
 0 = Logical Low (True)

A 220/330 ohm resistor pack allows the line to be terminated.

3.2.4 Step Interface

When the Step Interface line is activated in conjunction with the Direction In line, the read/write heads move in the direction defined by the Direction In line. The motion is initiated by a logical zero to a logical one transition or by the trailing edge of the step pulse. Any change in the Direction In line must be made one hundred nanoseconds before the leading edge of the step pulse. The quiescent state of this line should be held logically high (false).

The heads move at the rate of the incoming step pulses. Figure 8 contains the sequence and the requirements for step timing.

1870
The first of the year was a very dry one
and the crops were much injured by the
drought. The weather was very hot and
the crops were much injured by the
drought. The weather was very hot and
the crops were much injured by the
drought.

The second of the year was a very wet one
and the crops were much injured by the
flood. The weather was very cold and
the crops were much injured by the
flood.

The third of the year was a very dry one
and the crops were much injured by the
drought. The weather was very hot and
the crops were much injured by the
drought.

The fourth of the year was a very wet one
and the crops were much injured by the
flood. The weather was very cold and
the crops were much injured by the
flood.

The fifth of the year was a very dry one
and the crops were much injured by the
drought. The weather was very hot and
the crops were much injured by the
drought.

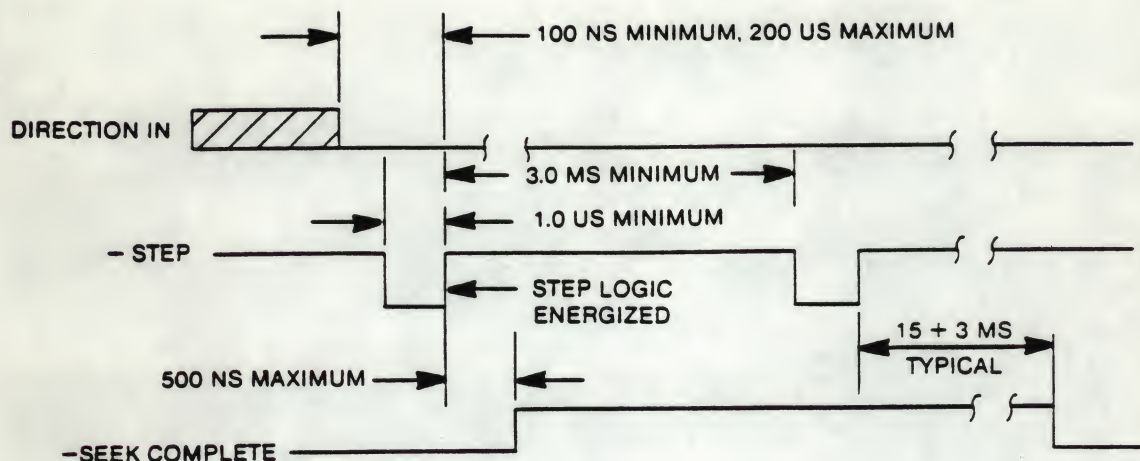


Figure 8

Step Mode Timing Diagram

3.2.5 Direction In

The Direction In line determines the motion of the read/write heads when a step pulse is issued. The motion is toward the center of the disk if the Direction In line is in the true (low) state when a step pulse occurs. The direction of the motion is away from the center of the disk if the Direction In line is in the false (high) state when a step pulse occurs.

A 220/330 ohm resistor pack allows the line to be terminated.

3.2.6 Drive Select

Drive Select lines 0 through 3 provide a means of selecting and deselecting a drive. These four lines select one of four drives that are daisy chained to the controller.

The drive address is determined by a select shunt on the Signal circuit board. Drive Select lines 0 through 3 provide a means of daisy changing a maximum of four drives to a controller.

When logically high (false), the output drivers are open circuits or logically high (false), and the drive receivers do not acknowledge signals presented to them. A Drive Select line must remain stable in the true (low) state until a Step or Read/Write command is executed.

Only one line can be true (low) at a time. An undefined operation might result if two or more units are assigned the same address or if two or more Drive Select lines are in the true (low) state simultaneously.

1. The first part of the report deals with the general situation of the country and the progress of the work during the year. It also mentions the results of the various expeditions and the collections made.

2. The second part of the report describes the various expeditions and the collections made. It mentions the names of the participants and the results of the work.

3. The third part of the report describes the various expeditions and the collections made. It mentions the names of the participants and the results of the work.

4. The fourth part of the report describes the various expeditions and the collections made. It mentions the names of the participants and the results of the work.

3.3 OUTPUT CONTROL LINES

The Output Control lines are enabled by their respective Drive Select line. They send status information to the controller, such as: drive selected, seek complete, Track000 fault, and line ready. In addition, the Index line is provided as an output to the controller for timing information.

The Output Control lines use an open collector gate that is capable of sinking a maximum of forty milliamperes in a logical low (true) level, with a maximum voltage of 0.4 volt measured at the driver. When the gate is off or logically high (false), the collector cutoff is a maximum of 250 u amps. See Figure 8 for the recommended circuit.

3.3.1 Drive Selected

When the Drive Selected lines coincide with the selected jumper on the shunt pack, the Select Status line goes logically low (true). This line informs the host system of the selection status of the drive.

NOTE

ONLY ONE DRIVE MAY BE SELECTED AT A TIME.

3.3.2 Seek Complete

The Seek Complete line indicates that the read/write heads have settled on the selected track at the end of a seek sequence. This status line is set logically zero (true) at the end of a normal seek. It is set logically high (false) in two cases:

1. A recalibration sequence is initiated by drive logic at power on because the heads are not over Track 000.
2. Five hundred nanoseconds, typical, after the leading edge of a step pulse or of a series of step pulses.

3.3.3 Track 000

The Track 000 line indicates to the host system that the read/write heads are positioned on Track 000. The Track 000 line goes logically low (true) only when the heads are positioned on Track 000. It remains low until the heads are moved away from Track 000, the outermost data track.

3.3.4 Fault

The Fault line indicates to the host system that a condition exists on the disk drive that is going to cause improper writing on the disk. When this line is logically low (true), Write Data is inhibited and further writing on the disk is prohibited until the condition is corrected. The condition under which the Fault line goes true is that D.C. voltages are grossly out of tolerance.

3.3.5 Line Ready

In conjunction with the Seek Complete line, the Line Ready line indicates to the host system that the disk drive can read, write or seek, and that all I/O signals are valid. The Line Ready line goes logically low (true) approximately 15 seconds after power on. The Line Ready line goes logically high (false) if the drive is not selected or if the speed of the motor is too slow. When this line is false, all writing and seeking is inhibited.

3.3.6 Index

An index pulse is provided once every revolution (16.67 ms nominal) to indicate the beginning of a track to the controller. The transition from logically high (false) to logically low (true) is the only valid transition. The leading edge of the pulse must be used to ensure accurate timing.

3.4 DATA TRANSFER LINES

The Data Transfer lines transfer information between the host system and the disk drive when the drive is selected. These lines are differential in nature. They may be multiplexed when using Drive Select.

The MFM Write Data pair of lines and the MFM Read Data pair of lines are provided for the transfer of data. Figure 9 contains a typical driver/receiver circuit combination used for data transfer signals.

3.4.1 MFM Write Data

The MFM Write Data lines are the differential pair that provide the data to be stored on the track. A flux reversal on the track to be written is caused when the plus (+) MFM

1911

1. The first part of the report deals with the general situation of the country and the progress of the work during the year.

2. The second part deals with the results of the work done during the year.

3. The third part deals with the conclusions reached during the year.

1912

1. The first part of the report deals with the general situation of the country and the progress of the work during the year.

2. The second part deals with the results of the work done during the year.

3. The third part deals with the conclusions reached during the year.

1913

1. The first part of the report deals with the general situation of the country and the progress of the work during the year.

2. The second part deals with the results of the work done during the year.

3. The third part deals with the conclusions reached during the year.

1914

1. The first part of the report deals with the general situation of the country and the progress of the work during the year.

2. The second part deals with the results of the work done during the year.

3. The third part deals with the conclusions reached during the year.

1915

1. The first part of the report deals with the general situation of the country and the progress of the work during the year.

2. The second part deals with the results of the work done during the year.

3. The third part deals with the conclusions reached during the year.

1916

1. The first part of the report deals with the general situation of the country and the progress of the work during the year.

2. The second part deals with the results of the work done during the year.

3. The third part deals with the conclusions reached during the year.

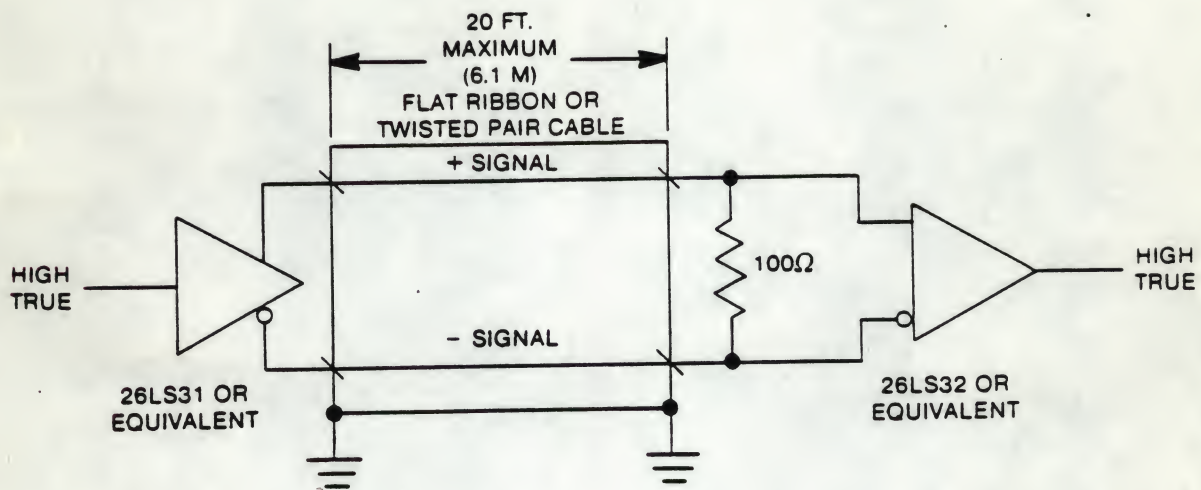


Figure 9

Data Line Driver/Receiver Circuit

Write Data line goes more positive than the minus (-) MFM Write Data line, provided that the Write Data line is logically low (true). When the disk drive is in a Read mode, the host system must ensure that the MFM write data signals are in the inactive state. The inactive state can be attained by making the plus MFM Write Data line more negative than the minus MFM Write Data line.

3.4.2 MFM Read Data

These lines are a differential pair that recover the data previously written on a track. A flux reversal on the track to be read is caused when the plus MFM Read Data line goes more positive than the minus MFM Read Data line. Subsequently, the differential pair signal is transmitted to the host system via the MFM Read Data lines.

APPENDIX A
CUSTOMER INFORMATION BULLETINS

CUSTOMER INFORMATION BULLETIN

TM600 RIGID DISK DRIVE

RAMPED SEEK MODE

Tandon uses a Customer Information Bulletin to inform our customers of changes in and improvements to our products. The following information is an option on the Tandon TM600 family of rigid disk drives that may be of interest in your application.

Our current drives are designed to operate at a minimum time between steps of three (3) milliseconds. Given eighteen (18) milliseconds for last step and settling time, this step rate results in an average seek time of 170 milliseconds for the 153 cylinder drive.

Customer requirements may necessitate a reduction in average seek time. By using the ramped seek mode and giving correct step pulse timing, the present drive's average access time can be improved.

A. In order to use a ramped seek, four major conditions must be met:

1. The drive must have a Control and Data circuit board, P/N 187045-001.
2. The Pins 8 and 9 programming shunt of the Control and Data circuit board must be closed (shorted).
3. The viscous damper must be mounted to the stepper motor.
4. The controller must issue step pulses in accordance with the algorithm below. Note that two pulses per track are required in ramped seek.

B. The pulse timing for single-track to nine-track seek is:

Two pulses separated by 1.5 milliseconds for each track, i.e., a one-track seek is equal to two pulses, a nine-track seek is equal to fourteen pulses.

The University of Chicago is a private, non-sectarian, non-profit institution of higher learning, founded in 1837. It is one of the leading universities in the United States, and is known for its high standards of academic excellence and its commitment to research and scholarship.

The University of Chicago is a private, non-sectarian, non-profit institution of higher learning, founded in 1837. It is one of the leading universities in the United States, and is known for its high standards of academic excellence and its commitment to research and scholarship.

The University of Chicago is a private, non-sectarian, non-profit institution of higher learning, founded in 1837. It is one of the leading universities in the United States, and is known for its high standards of academic excellence and its commitment to research and scholarship.

The University of Chicago is a private, non-sectarian, non-profit institution of higher learning, founded in 1837. It is one of the leading universities in the United States, and is known for its high standards of academic excellence and its commitment to research and scholarship.

The University of Chicago is a private, non-sectarian, non-profit institution of higher learning, founded in 1837. It is one of the leading universities in the United States, and is known for its high standards of academic excellence and its commitment to research and scholarship.

The University of Chicago is a private, non-sectarian, non-profit institution of higher learning, founded in 1837. It is one of the leading universities in the United States, and is known for its high standards of academic excellence and its commitment to research and scholarship.

The University of Chicago is a private, non-sectarian, non-profit institution of higher learning, founded in 1837. It is one of the leading universities in the United States, and is known for its high standards of academic excellence and its commitment to research and scholarship.

The University of Chicago is a private, non-sectarian, non-profit institution of higher learning, founded in 1837. It is one of the leading universities in the United States, and is known for its high standards of academic excellence and its commitment to research and scholarship.

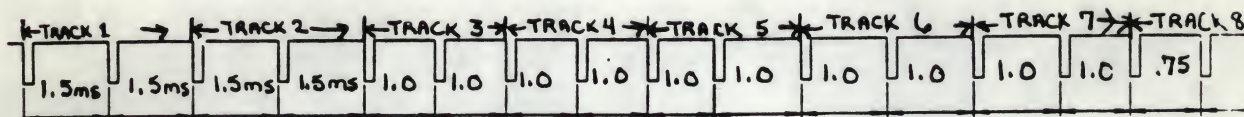
The University of Chicago is a private, non-sectarian, non-profit institution of higher learning, founded in 1837. It is one of the leading universities in the United States, and is known for its high standards of academic excellence and its commitment to research and scholarship.

The University of Chicago is a private, non-sectarian, non-profit institution of higher learning, founded in 1837. It is one of the leading universities in the United States, and is known for its high standards of academic excellence and its commitment to research and scholarship.

The University of Chicago is a private, non-sectarian, non-profit institution of higher learning, founded in 1837. It is one of the leading universities in the United States, and is known for its high standards of academic excellence and its commitment to research and scholarship.

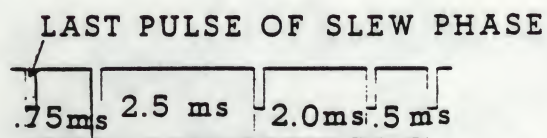
C. Pulse timing for an 10 track seek or greater.

1. Acceleration Phase:



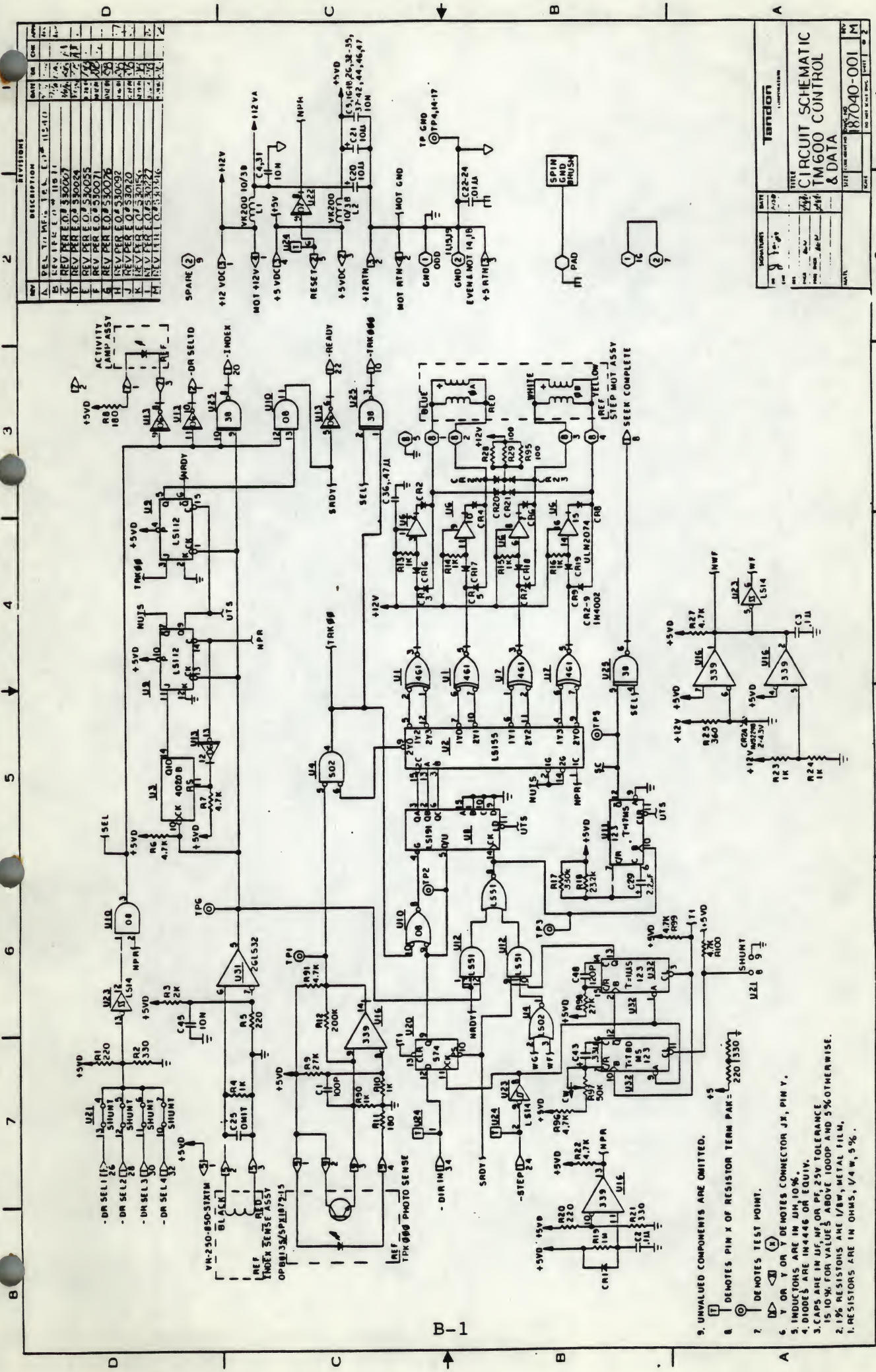
2. Slew Phase: two pulses separated by .75 milliseconds for each track.

3. Deceleration Phase: last two tracks or seek.



If you have any questions or need additional information, please do not hesitate to contact me.

APPENDIX B
SCHEMATICS



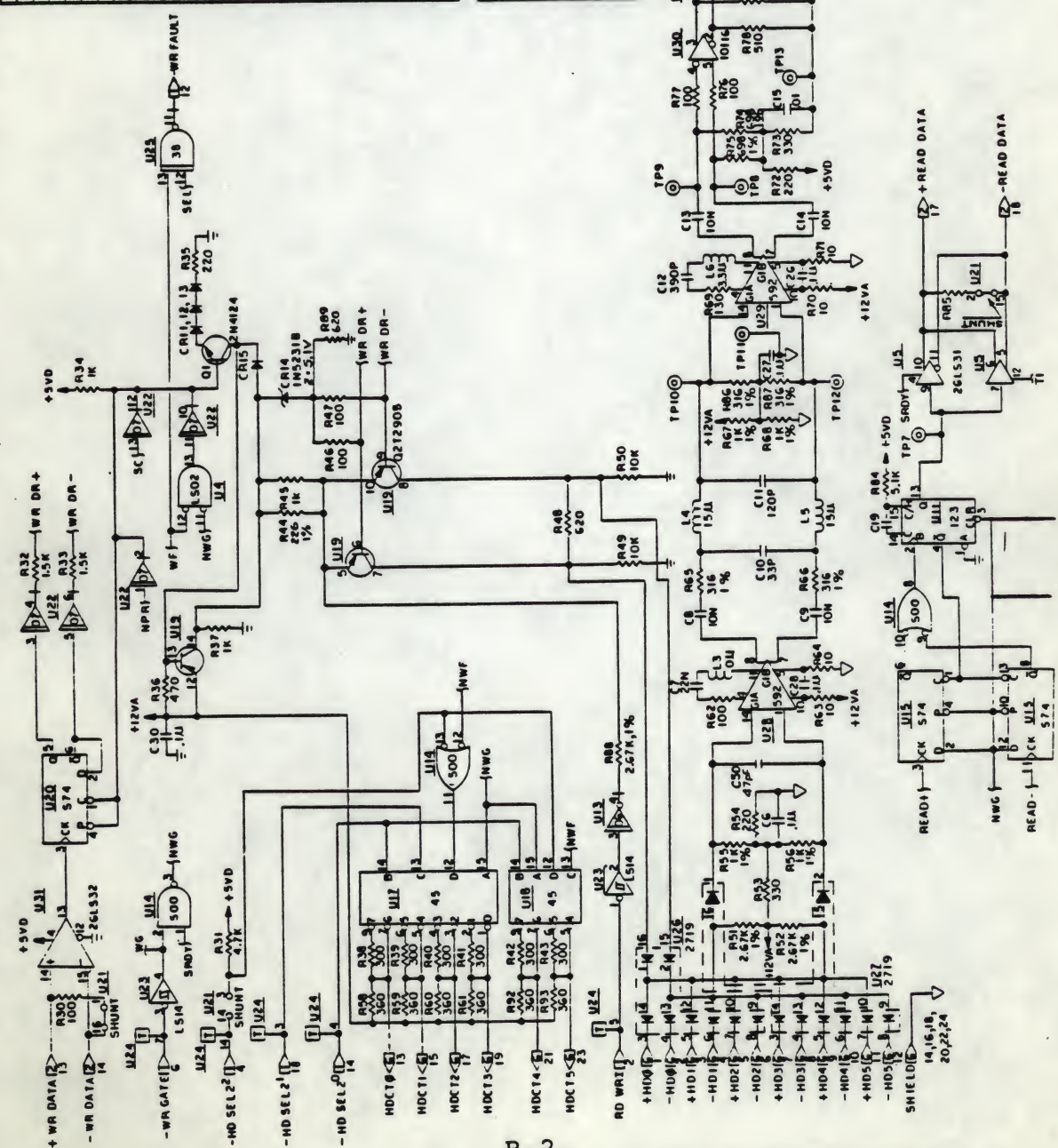
REVISIONS	
REV	DESCRIPTION
1	DEL T1 MEAS TOL 115.40
2	REV PER E0730007
3	REV PER E0730007
4	REV PER E0730007
5	REV PER E0730007
6	REV PER E0730007
7	REV PER E0730007
8	REV PER E0730007
9	REV PER E0730007
10	REV PER E0730007
11	REV PER E0730007
12	REV PER E0730007
13	REV PER E0730007
14	REV PER E0730007
15	REV PER E0730007
16	REV PER E0730007
17	REV PER E0730007
18	REV PER E0730007
19	REV PER E0730007
20	REV PER E0730007
21	REV PER E0730007
22	REV PER E0730007
23	REV PER E0730007
24	REV PER E0730007
25	REV PER E0730007
26	REV PER E0730007
27	REV PER E0730007
28	REV PER E0730007
29	REV PER E0730007
30	REV PER E0730007
31	REV PER E0730007
32	REV PER E0730007
33	REV PER E0730007
34	REV PER E0730007
35	REV PER E0730007
36	REV PER E0730007
37	REV PER E0730007
38	REV PER E0730007
39	REV PER E0730007
40	REV PER E0730007
41	REV PER E0730007
42	REV PER E0730007
43	REV PER E0730007
44	REV PER E0730007
45	REV PER E0730007
46	REV PER E0730007
47	REV PER E0730007
48	REV PER E0730007
49	REV PER E0730007
50	REV PER E0730007
51	REV PER E0730007
52	REV PER E0730007
53	REV PER E0730007
54	REV PER E0730007
55	REV PER E0730007
56	REV PER E0730007
57	REV PER E0730007
58	REV PER E0730007
59	REV PER E0730007
60	REV PER E0730007
61	REV PER E0730007
62	REV PER E0730007
63	REV PER E0730007
64	REV PER E0730007
65	REV PER E0730007
66	REV PER E0730007
67	REV PER E0730007
68	REV PER E0730007
69	REV PER E0730007
70	REV PER E0730007
71	REV PER E0730007
72	REV PER E0730007
73	REV PER E0730007
74	REV PER E0730007
75	REV PER E0730007
76	REV PER E0730007
77	REV PER E0730007
78	REV PER E0730007
79	REV PER E0730007
80	REV PER E0730007
81	REV PER E0730007
82	REV PER E0730007
83	REV PER E0730007
84	REV PER E0730007
85	REV PER E0730007
86	REV PER E0730007
87	REV PER E0730007
88	REV PER E0730007
89	REV PER E0730007
90	REV PER E0730007
91	REV PER E0730007
92	REV PER E0730007
93	REV PER E0730007
94	REV PER E0730007
95	REV PER E0730007
96	REV PER E0730007
97	REV PER E0730007
98	REV PER E0730007
99	REV PER E0730007
100	REV PER E0730007

Tandon	
DATE	REV
10/1/77	1
10/1/77	2
10/1/77	3
10/1/77	4
10/1/77	5
10/1/77	6
10/1/77	7
10/1/77	8
10/1/77	9
10/1/77	10
10/1/77	11
10/1/77	12
10/1/77	13
10/1/77	14
10/1/77	15
10/1/77	16
10/1/77	17
10/1/77	18
10/1/77	19
10/1/77	20
10/1/77	21
10/1/77	22
10/1/77	23
10/1/77	24
10/1/77	25
10/1/77	26
10/1/77	27
10/1/77	28
10/1/77	29
10/1/77	30
10/1/77	31
10/1/77	32
10/1/77	33
10/1/77	34
10/1/77	35
10/1/77	36
10/1/77	37
10/1/77	38
10/1/77	39
10/1/77	40
10/1/77	41
10/1/77	42
10/1/77	43
10/1/77	44
10/1/77	45
10/1/77	46
10/1/77	47
10/1/77	48
10/1/77	49
10/1/77	50
10/1/77	51
10/1/77	52
10/1/77	53
10/1/77	54
10/1/77	55
10/1/77	56
10/1/77	57
10/1/77	58
10/1/77	59
10/1/77	60
10/1/77	61
10/1/77	62
10/1/77	63
10/1/77	64
10/1/77	65
10/1/77	66
10/1/77	67
10/1/77	68
10/1/77	69
10/1/77	70
10/1/77	71
10/1/77	72
10/1/77	73
10/1/77	74
10/1/77	75
10/1/77	76
10/1/77	77
10/1/77	78
10/1/77	79
10/1/77	80
10/1/77	81
10/1/77	82
10/1/77	83
10/1/77	84
10/1/77	85
10/1/77	86
10/1/77	87
10/1/77	88
10/1/77	89
10/1/77	90
10/1/77	91
10/1/77	92
10/1/77	93
10/1/77	94
10/1/77	95
10/1/77	96
10/1/77	97
10/1/77	98
10/1/77	99
10/1/77	100

B-1

IC LOCATION AND VOLTAGE CHART				
LOCATION	TYPE	+5	+12	UNUSED
U14	74500	14	7	1/4
U13	74LS02	14	7	1/4
U12	7406	14	7	1/4
U22	7407	14	7	1/4
U23	74LS14	14	7	1/4
U25	7438	14	7	1/2
U12	74LS51	14	7	1/2
U20,13	74574	14	7	
U9	74LS112	16	8	
U11,32	74123	16	8	
U17,18	7445	16	8	
U2	74LS155	16	8	
U8	74LS191	16	8	
U5	26LS31	16	8	1/4
U31	26LS32	16	8	1/4
U30	1011C	16	8	
U3	4020B	16	8	
U17	75461	16	8	
U20,29	592	NOTED	NOTED	
U19	Q212505	NOTED	NOTED	
U6	UN12074	18,9,9	4,5,12,13	1/4
U16	LM339	3	12	
U24	220/330 PAK	1C	8	6/4
U21	SHUNT			
U10	7408	14	7	1/4
U26,27	2715			

SHUNT PROGRAMMING	
FACTORY	USAGE
1-16	WRITE TERMINATOR
1-15	READ TERMINATOR
2-15	WRITE SELECT
2-14	READ SELECT
3-15	WRITE LINK
3-14	READ LINK
4-15	WRITE ADDRESS
4-14	READ ADDRESS
5-15	WRITE DATA
5-14	READ DATA
6-15	WRITE DATA
6-14	READ DATA
7-15	WRITE DATA
7-14	READ DATA
8-15	WRITE DATA
8-14	READ DATA
9-15	WRITE DATA
9-14	READ DATA
10-15	WRITE DATA
10-14	READ DATA
11-15	WRITE DATA
11-14	READ DATA
12-15	WRITE DATA
12-14	READ DATA
13-15	WRITE DATA
13-14	READ DATA
14-15	WRITE DATA
14-14	READ DATA
15-15	WRITE DATA
15-14	READ DATA
16-15	WRITE DATA
16-14	READ DATA
17-15	WRITE DATA
17-14	READ DATA
18-15	WRITE DATA
18-14	READ DATA
19-15	WRITE DATA
19-14	READ DATA
20-15	WRITE DATA
20-14	READ DATA
21-15	WRITE DATA
21-14	READ DATA
22-15	WRITE DATA
22-14	READ DATA
23-15	WRITE DATA
23-14	READ DATA
24-15	WRITE DATA
24-14	READ DATA
25-15	WRITE DATA
25-14	READ DATA
26-15	WRITE DATA
26-14	READ DATA
27-15	WRITE DATA
27-14	READ DATA
28-15	WRITE DATA
28-14	READ DATA
29-15	WRITE DATA
29-14	READ DATA
30-15	WRITE DATA
30-14	READ DATA
31-15	WRITE DATA
31-14	READ DATA
32-15	WRITE DATA
32-14	READ DATA
33-15	WRITE DATA
33-14	READ DATA
34-15	WRITE DATA
34-14	READ DATA
35-15	WRITE DATA
35-14	READ DATA
36-15	WRITE DATA
36-14	READ DATA
37-15	WRITE DATA
37-14	READ DATA
38-15	WRITE DATA
38-14	READ DATA
39-15	WRITE DATA
39-14	READ DATA
40-15	WRITE DATA
40-14	READ DATA
41-15	WRITE DATA
41-14	READ DATA
42-15	WRITE DATA
42-14	READ DATA
43-15	WRITE DATA
43-14	READ DATA
44-15	WRITE DATA
44-14	READ DATA
45-15	WRITE DATA
45-14	READ DATA
46-15	WRITE DATA
46-14	READ DATA
47-15	WRITE DATA
47-14	READ DATA
48-15	WRITE DATA
48-14	READ DATA
49-15	WRITE DATA
49-14	READ DATA
50-15	WRITE DATA
50-14	READ DATA
51-15	WRITE DATA
51-14	READ DATA
52-15	WRITE DATA
52-14	READ DATA
53-15	WRITE DATA
53-14	READ DATA
54-15	WRITE DATA
54-14	READ DATA
55-15	WRITE DATA
55-14	READ DATA
56-15	WRITE DATA
56-14	READ DATA
57-15	WRITE DATA
57-14	READ DATA
58-15	WRITE DATA
58-14	READ DATA
59-15	WRITE DATA
59-14	READ DATA
60-15	WRITE DATA
60-14	READ DATA
61-15	WRITE DATA
61-14	READ DATA
62-15	WRITE DATA
62-14	READ DATA
63-15	WRITE DATA
63-14	READ DATA
64-15	WRITE DATA
64-14	READ DATA
65-15	WRITE DATA
65-14	READ DATA
66-15	WRITE DATA
66-14	READ DATA
67-15	WRITE DATA
67-14	READ DATA
68-15	WRITE DATA
68-14	READ DATA
69-15	WRITE DATA
69-14	READ DATA
70-15	WRITE DATA
70-14	READ DATA
71-15	WRITE DATA
71-14	READ DATA
72-15	WRITE DATA
72-14	READ DATA
73-15	WRITE DATA
73-14	READ DATA
74-15	WRITE DATA
74-14	READ DATA
75-15	WRITE DATA
75-14	READ DATA
76-15	WRITE DATA
76-14	READ DATA
77-15	WRITE DATA
77-14	READ DATA
78-15	WRITE DATA
78-14	READ DATA
79-15	WRITE DATA
79-14	READ DATA
80-15	WRITE DATA
80-14	READ DATA
81-15	WRITE DATA
81-14	READ DATA
82-15	WRITE DATA
82-14	READ DATA
83-15	WRITE DATA
83-14	READ DATA
84-15	WRITE DATA
84-14	READ DATA
85-15	WRITE DATA
85-14	READ DATA
86-15	WRITE DATA
86-14	READ DATA
87-15	WRITE DATA
87-14	READ DATA
88-15	WRITE DATA
88-14	READ DATA
89-15	WRITE DATA
89-14	READ DATA
90-15	WRITE DATA
90-14	READ DATA
91-15	WRITE DATA
91-14	READ DATA
92-15	WRITE DATA
92-14	READ DATA
93-15	WRITE DATA
93-14	READ DATA
94-15	WRITE DATA
94-14	READ DATA
95-15	WRITE DATA
95-14	READ DATA
96-15	WRITE DATA
96-14	READ DATA
97-15	WRITE DATA
97-14	READ DATA
98-15	WRITE DATA
98-14	READ DATA
99-15	WRITE DATA
99-14	READ DATA
100-15	WRITE DATA
100-14	READ DATA



REFERENCE DESIGNATORS	
LAST USED	NOT USED
C50	
C63	
L6	
R00	
Q1	
U32	
TP19	

TAYLOR

CIRCUIT SCHEMATIC, TM600 CONTROL & DATA

DATE: 11/1/71

DESIGNED BY: J. A. N. J.

DRAWN BY: J. A. N. J.

CHECKED BY: J. A. N. J.

APPROVED BY: J. A. N. J.

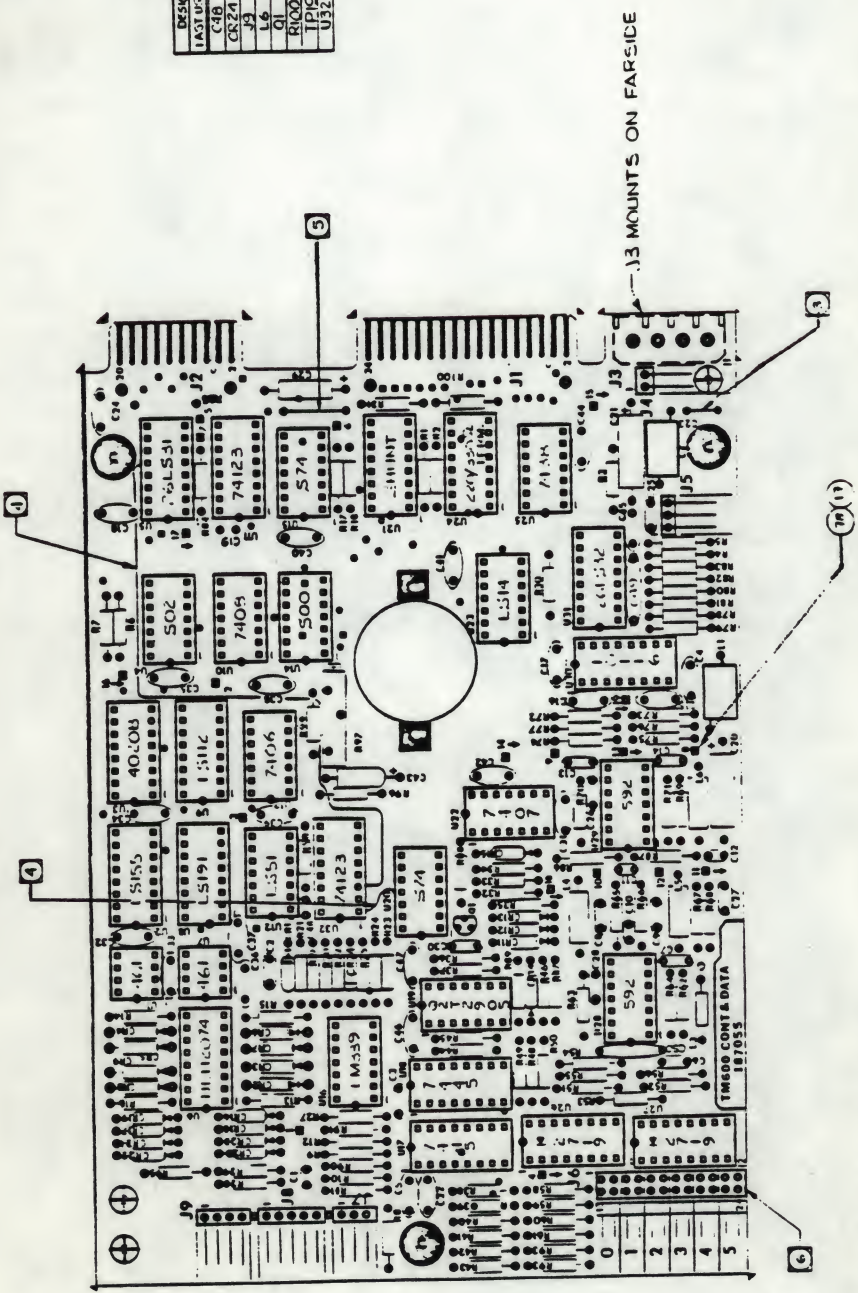
187040-001

REV. 1

REV	DESCRIPTION	DATE	BY	CHK
1	REV PER E.O. 53007	10/1/71	WJ	WJ
2	REV PER E.O. 53007	10/1/71	WJ	WJ
3	REV PER E.O. 53007	10/1/71	WJ	WJ
4	REV PER E.O. 53007	10/1/71	WJ	WJ
5	REV PER E.O. 53007	10/1/71	WJ	WJ
6	REV PER E.O. 53007	10/1/71	WJ	WJ
7	REV PER E.O. 53007	10/1/71	WJ	WJ
8	REV PER E.O. 53007	10/1/71	WJ	WJ
9	REV PER E.O. 53007	10/1/71	WJ	WJ
10	REV PER E.O. 53007	10/1/71	WJ	WJ
11	REV PER E.O. 53007	10/1/71	WJ	WJ
12	REV PER E.O. 53007	10/1/71	WJ	WJ
13	REV PER E.O. 53007	10/1/71	WJ	WJ
14	REV PER E.O. 53007	10/1/71	WJ	WJ
15	REV PER E.O. 53007	10/1/71	WJ	WJ
16	REV PER E.O. 53007	10/1/71	WJ	WJ
17	REV PER E.O. 53007	10/1/71	WJ	WJ
18	REV PER E.O. 53007	10/1/71	WJ	WJ
19	REV PER E.O. 53007	10/1/71	WJ	WJ
20	REV PER E.O. 53007	10/1/71	WJ	WJ

DESIGNATION	ASSEMBLY NAME	DATE
1	ASSEMBLY NAME	DATE
2	ASSEMBLY NAME	DATE
3	ASSEMBLY NAME	DATE
4	ASSEMBLY NAME	DATE
5	ASSEMBLY NAME	DATE
6	ASSEMBLY NAME	DATE
7	ASSEMBLY NAME	DATE
8	ASSEMBLY NAME	DATE
9	ASSEMBLY NAME	DATE
10	ASSEMBLY NAME	DATE
11	ASSEMBLY NAME	DATE
12	ASSEMBLY NAME	DATE
13	ASSEMBLY NAME	DATE
14	ASSEMBLY NAME	DATE
15	ASSEMBLY NAME	DATE
16	ASSEMBLY NAME	DATE
17	ASSEMBLY NAME	DATE
18	ASSEMBLY NAME	DATE
19	ASSEMBLY NAME	DATE
20	ASSEMBLY NAME	DATE

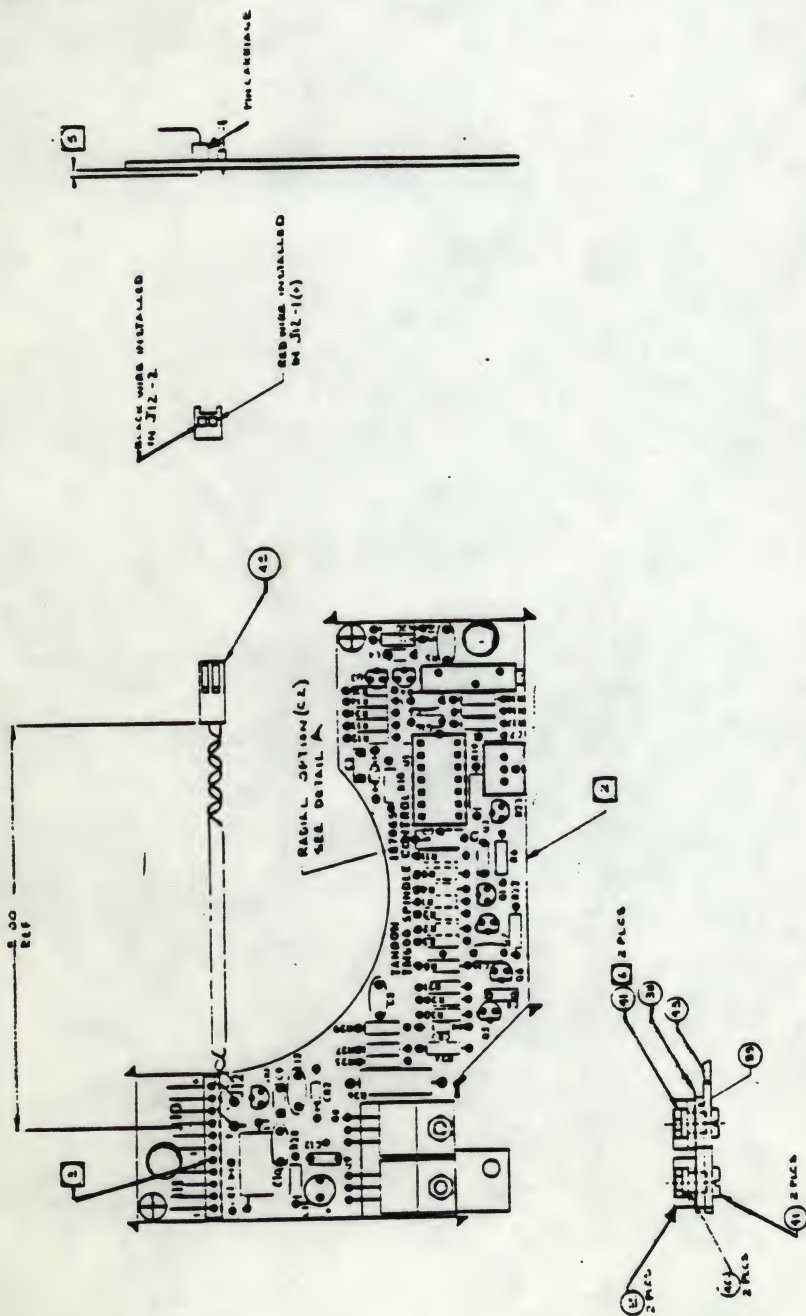
Tandon	
REV	DATE
1	10/1/71
2	10/1/71
3	10/1/71
4	10/1/71
5	10/1/71
6	10/1/71
7	10/1/71
8	10/1/71
9	10/1/71
10	10/1/71
11	10/1/71
12	10/1/71
13	10/1/71
14	10/1/71
15	10/1/71
16	10/1/71
17	10/1/71
18	10/1/71
19	10/1/71
20	10/1/71



1. HAVE CONNECTOR 16 TO 0.60 INCHES ABOVE SURFACE PER E.O. 53007.
2. JIMMY PER E.O. 53007.
3. JIMMY PER E.O. 53007.
4. SOLDER 404 AND UNTERMINATED THE COATED GOLD - OTHER WIRE.
5. MAX. "ARCHITECTURE" 1/4" RESISTOR (1/4" WIRE).
6. REF. DOCUMENT : 181040-001 - CIRCUIT SCHEMATIC
7. 181042-001 - ARTWORK.
8. 181042-001 - ARTWORK.
9. 181042-001 - ARTWORK.
10. 181042-001 - ARTWORK.
11. 181042-001 - ARTWORK.
12. 181042-001 - ARTWORK.
13. 181042-001 - ARTWORK.
14. 181042-001 - ARTWORK.
15. 181042-001 - ARTWORK.
16. 181042-001 - ARTWORK.
17. 181042-001 - ARTWORK.
18. 181042-001 - ARTWORK.
19. 181042-001 - ARTWORK.
20. 181042-001 - ARTWORK.

NO	DESCRIPTION	DATE	AMOUNT	REMARKS
1	REV PER	11-21		
2	REV PER	11-21		
3	REV PER	11-21		
4	REV PER	11-21		

DATE	1-4-73	BOOK NO.	44
Tandon		SPINDLE CONTROL	
		A5EY	
		TM600	
		1149093-001	
		E	



7. Ref DOCUMENT , 187-000 CUMULAT SUBJECTIVE
197-000 - 197-000 : APPROVED

7 JUL 24 5 41 PM '64

MAX LENGTH OF . IMPROVEMENT LEADS BELOW ORDER SIZE
ROUND AFTER ALLEGEDLY 4 TRIMMING SMALL NOT EXCEED .00 MM.

4. COMPONENT WEIGHT, EXCEPT CIL, SHALL NOT EXCEED .45 GRAMS ABOVE BOARD CAPACITY & CIL, NOT TO EXCEED .55 GRAMS ABOVE BOARD.

3 CUT PIN TANGENT TO FIM CIRCLE.

2 THIS ASSEMBLY SHALL BE MADE FROM P.C.B. W/TAPE 18760-001

1. 75.1% PER STANDARD MANUFACTURING METHOD.

